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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of:
Salvatore Peragine, et al.
Serial No.: 10/519,691
Filed: 12/27/2004
For: STRUCTURE .... CELLS

Group: 1795

Examiner: Phasge, Arun S.

1185 Avenue of the Americas
New York, N.Y. 10036
November 6, 2009

# BRIEF ON APPEAL

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

## REAL PARTY IN INTEREST

The real party in interest in the above application is Elettrodi De Nora S.p.A., an Italian corporation by means of an assignment from the inventor.

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Another feature of the invention is an electrolysis diaphragm cell with an anode compartment and a cathodic compartment separated by an inert porous diaphragm, the cathodic compartment consisting of a perimetrical chamber provided with at least one nozzle in the bottom for discharging electrolytes and with at least one nozzle in the top for gas outlet and a plurality of cathode fingers electrically connected to the perimetrical chamber (lines 8 to 25 of page 7) and a process for chloro-alkali electrolysis using said cell.

## GROUNDS OF REJECTION

Claims 1 to 20 have been rejected under 35 USC 103 as being obvious over the Pimlott et al patent taken in view of the Currey et al patent. The Examiner states that the Pimlott patent discloses the claimed electrode structure comprising a hollow body defining an internal volume in fluid communication with a perimetrical chamber, said hollow body housing a reinforcing and electric current distributing internal element constituted by at least one sheet provided with projections, wherein said projections have a shape equivalent to spherical caps or elliptic caps or caps with prismatic sections and the Examiner concedes that the Pimlott patent fails to disclose that chamber is delimited by a conductive surface provided with holes coated with chemically inert porous diaphragm. The Examiner cites the Currey patent teaches the use of holes coated with chemically inert porous diaphragms as claimed. The Examiner contends that membrane cells and diaphragm cells "are interchangeable in the art" citing U.S. Patent No. 4,488,946.

## APPLICANTS' ARGUMENTS

Applicants request the Board of Patent Appeals and Interferences to reverse the Examiner's rejection since membrane cell technology is completely non-analogous to diaphragm cell technology. It is well known to everyone skilled in the art that chlor-alkali electrolysis can be subdivided into three distinct processes, namely:

1. membrane process
2. diaphragm process
3. mercury process

and that such processes make use of corresponding disitinct cells, cannot only be inferred by the proceedings of any international conference on the subject (e.g. World Chlorine Council or Euro Chloro-sponsored congresses) but even easily found in Wikipedia (http://en.wikipedia.org/wiki/Chloralkali_process). Moreover, a "cathodic finger structure" is known since at least forty years in the art to be a specific type of electrode (not a membrane electrolyser chamber!) made of a foraminous box or flattened tube having a porous diaphragm deposited thereon (see for instance US 3,899,408; US 3,617,461; US 3,910,827; US 3,945,909). US 4,628,596 (Currey et al), cited by the Examiner, also mentions "cathode fingers". Applicants submit that claims of the present application are directed to a "cathodic finger structure" (which is equivalent to "cathode finger") of a diaphragm electrolytic cell. Pimlott et al is neither directed to a cathodic finger structure nor to a structural element or component of a diaphragm electrolyser, therefore it cannot anticipate or render obvious the claims of the instant application which are directed to a "cathodic finger structure of diaphragm electrolytic cell".

Currey et al is silent on the main characterizing feature of the instantly claimed finger structure (a reinforcing and electric current distributing internal element constituted by at least one sheet provided with projections housed in the hollow portion of the finger).

The technical problem of improving the current distribution over the surface of a cathode finger of a diaphragm electrolyzer is not addressed by Currey et al, whose purpose is to reduce the inter-electrodic gap (which is a totally different problem cited on page 2 of the present specification. The solution to such technical problem consisting of inserting a conductive sheet of improved design inside such hollow portion of the finger is consequently neither mentioned nor remotely suggested by Currey et al.

The Morris et al patent referred to by the Examiner is directed to ion-exchange membrane cells and does not equate the same with diaphragm cells. The Board's attention is directed to lines 38 to 53 of column 1 of the Pimlott et al patent which discusses the difference between the two types of cells which clearly points out that one skilled in the art clearly knows the 2 types of cells are clearly patentably distinct and are not "interchangeable in the art" as the Examiner alleges. Therefore, withdrawal of this ground of rejection is requested.

Applicants traverse this rejection since the Examiner obviously does not understand that the technology for diaphragm cells and membrane cells are entirely different and the two terms of diaphragm and membrane electrolyzers are not routinely used as synonyms of each other. The Examiner is wrong when he states that there is no structure to distinguish between the two types

of cells. In the Response to Applicants' Arguments, the Examiner states that "arguments filed 4/7/09 have been fully considered" but they were not. The Examiner merely refused to acknowledge the difference between a membrane cell and a diaphragm cell, without bothering to consider any further remark. The Examiner further stated that "Applicants cited references which allege a difference between the two types of elctrolyzer without a claim basis": Applicants do not subscribe to this view, since claims recite structural features that are nowhere to be found in Pimlott or in any other type of membrane cell.

Applicants' multiple arguments to defend inventiveness of pending claims can be summarized as follows:

1) Membrane chlor-alkali cells and diaphragm chlor-alkali cells are patentably distinct technologies

Applicants have provided an internet link as a handy reference by way of example, but any person skilled in the art of chlor-alkali electrolysis knows the difference between the two technologies. Also, Pimlott et al. are certainly to be counted among such persons, since they make a clear distinction between the two technologies in col. 1, lines 38-52 of their patent, wherein diaphragm cells provided with finger structures are criticized and explicitly disclaimed. Applicants believe that the improvement of the instant invention is instrumental in making diaphragm cells competitive again with membrane cells, but Pimlott et al.'s invention is clearly aimed at improving membrane cells without taking the older diaphragm technology into consideration.

2) The cited prior does not anticipate the claimed cathode finger structure.

Pimlott et al.'s cell has no cathode finger whatsoever. Currey et al. is directed to improving an anode and not a cathode. Currey et al. is silent on the main characterizing feature of the instantly claimed finger structure, namely a reinforcing and electric current distributing internal element consisting of at least one sheet provided with projections housed in the hollow portion of the finger. The technical problem of improving the current distribution over the surface of a cathode finger of a diaphragm electrolyzer is not addressed by Currey et al., whose purpose is to reduce the inter-electrodic gap (which is a totally different problem cited on page 2 of the present specification). The solution to such technical problem consisting of inserting a conductive sheet of improved design inside such hollow portion of the finger is consequently neither mentioned nor remotely suggested by Currey et al.

3) Pimlott et al. does not teach how to improve the conductivity of a cathodic structure

In the previous Office action, the Examiner stated that "the Pimlott patent discloses the claimed electrode structure comprising a hollow body defining an internal volume (...) said hollow body housing a reinforcing and electric current distributing internal element". This is simply not true. At best, the Pimlott et al. patent disclosed a membrane electrolysis chamber, not an electrode structure, housing a reinforcing and electric current distributing internal element. Such membrane electrolysis chamber, in its turn, contains electrodes (anodes and cathodes). The electrodes of Pimlott et al.: 1) are not finger structures which are exclusive of diaphragm cells and 2) have no reinforcing and electric current distributing internal element.

If equating membrane and diaphragm cells is incorrect, equating a whole cell and an electrode of another cell is simply unbelievable.

4) None of the cited prior art documents address the problem solved by the present invention.

The present invention solves the problem of improving the electrical conductivity and the internal fluid distribution of a cathode finger structure of a diaphragm cell. The cited references are silent regarding such a problem.

The Board of Patent Appeals and Interferences is requested to reverse the Examiner's rejection since diaphragm cell technology and membrane cell technology are technically different technologies. Applicants are submitting the $540 fee for filing the Appeal Brief.

Respectfully submitted,

Charles A. Muserlian #19,683
Attorney for Applicants
Tel. 212 302 8989

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Enclosures

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## CLAIMS APPENDIX

The claims in the application are:

**Claim 1** (previously presented) A cathodic finger structure for diaphragm electrolytic cell, comprising a hollow body defining an internal volume in fluid communication with a perimetrical chamber and delimited by a conductive surface provided with holes coated with chemically inert porous diaphragm, said hollow body housing a reinforcing and electric current distributing internal element constituted by at least one sheet provided with projections, wherein said projections have a shape equivalent to spherical caps or elliptic caps or caps with prismatic sections.

**Claim 2** (previously presented) The finger structure of claim 1, wherein the conductive surface provided with holes is an interwoven wire mesh or a perforated sheet.

**Claim 3** (previously presented) The finger structure of claim 1 wherein said at least one sheet is a single sheet provided with projections on both its major surfaces.

**Claim 4** (previously presented) The finger structure according to claim 1 wherein said sheet provided with projections is secured to said conductive surface by means of an electrically conductive connection.

**Claim 5** (previously presented) The finger structure of claim 4, wherein said conductive connection is located on the apex of at least part of said projections.

**Claim 6** (previously presented) The finger structure of claim 4 wherein said conductive connection establishes a plurality of generally equivalent ohmic paths for the uniform distribution of electric current.

**Claim 7** (previously presented) The finger structure of claim 1 wherein said projections are arranged according to a square mesh pattern.

**Claim 8** (previously presented) The finger structure of claim 1 wherein said projections are arranged according to a quincuncial pattern.

**Claim 9** (previously presented) The finger structure of claim 1 wherein each vertical section of said at least one sheet comprises part of at least one of said projections.

**Claim 10** (previously presented) The finger structure of claim 1 wherein the distance between the centers of two adjacent caps is between 50 and 65 millimeters and the radii of extrados and intrados of said caps are between 17 and 22 millimeters and between 12 and 16 millimeters respectively.

**Claim 11** (previously presented) The finger structure of claim 1 wherein the

thickness of said sheet is comprised between 5 and 7 millimeters.

**Claim 12** (previously presented) The finger structure of claim 1 wherein said internal volume defined by said hollow body is subdivided by said at least one sheet into two portions in fluid communication with said perimetrical chamber, and said portions are only partially occupied by said projections and are available for the natural internal recirculation of electrolytes.

**Claim 13** (previously presented) The finger structure of claim 1 wherein said at least one sheet provided with projections is further provided with openings in the residual flat areas.

**Claim 14** (previously presented) The finger structure of claim 1 wherein said projections are obtained by plastic deformation of said at least one sheet.

**Claim 15** (previously presented) The finger of claim 1 wherein said projections are independent pieces secured onto said at least one sheet.

**Claim 16** (previously presented) The finger according to claim 15, wherein said projections are secured onto said at least one sheet by welding or brazing.

**Claim 17** (previously presented) An electrolysis cell comprising an anodic

compartment and a cathodic compartment separated by an inert porous diaphragm, wherein said cathodic compartment consists of a perimetrical chamber provided with at least one nozzle in the bottom for discharging electrolytes and with at least one nozzle in the top for gas outlet, and of a plurality of cathodic fingers according to claim 1 electrically connected to said perimetrical chamber.

**Claim 18** (previously presented) A process of chlor-alkali electrolysis, comprising feeding a sodium chloride solution to the anodic compartment of the cell of claim 17, applying electric current and discharging a solution of caustic soda and depleted sodium chloride formed inside said internal volume of said plurality of cathodic fingers through said nozzle for discharging electrolytes and a hydrogen flow through said nozzle for gas outlet.

**Claim 19** (previously presented) The process of claim 18 wherein said hydrogen has free ascensional motion inside the internal volume of said plurality of cathodic fingers and free longitudinal motion towards said perimetrical chamber, and in that said solution of caustic soda and depleted sodium chloride has free recirculation in the internal volume of said plurality of cathodic fingers.

**Claim 20** (currently amended) The process of claim 19, ~~characterised in that~~ wherein said hydrogen has free ascensional motion inside the internal volume of said plurality of cathodic fingers and free longitudinal motion towards said perimetrical chamber, and in that said solution of caustic soda and depleted sodium chloride has free recirculation in the internal

volume of said plurality of cathodic fingers

**Claim 21**. (cancelled).

# EVIDENCE APPENDIX

None

# RELATED PROCEEDINGS APPENDIX

None

## CERTIFICATION OF FACSIMILE TRANSMISSION

I hereby certify that this paper is being facsimile transmitted to the Patent and Trademark Office on the date shown below.

Charles A. Muserlian
Charles A. Muserlian #19,683

11-6-09

Serial No. 10/519,691

267.186

## RELATED APPEALS AND INTERFERENCES

There are no other prior and pending appeals, interferences or judiciary proceedings which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision.

## STATUS OF THE CLAIMS

Claims 1 to 20 are rejected, Claim 21 is cancelled.

## STATUS OF THE AMENDMENTS

A response was filed on April 7, 2009 but was not deemed to put the application in condition for allowance.

## SUMMARY OF THE CLAIMED SUBJECT MATTER

The invention is directed to a finger structures for chloro-alkali diaphragm cells provided with high conductivity and capable of ensuring a substantial homogeneity of electric current distribution on the whole surface of the fingers (lines 9 to 12 of page 6 – Figs. 1 to 3).